

Claims: I claim:

1. An apparatus for coupling a laser diode to a single-mode fiber comprising:

- (a) a laser diode for emitting astigmatic and elliptical light, where the long axis of the ellipse is the fast axis, the short axis of the ellipse is the slow axis, and said fast and slow axes are perpendicular;
- (b) a collimating lens for collimating said light emitted from said laser diode in one of said axes;
- (c) a first cylindrical lens for focusing said light emitted from said laser diode in the other one of said axes after passing through said collimating lens, where said focused light diverges after being focused;
- (d) a second cylindrical lens for collimating said diverging light after being focused by said first cylindrical lens, where the beam-waist of said light collimated by said second cylindrical lens in said other one of said axes is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes; and
- (e) a low-feedback-noise fiber collimator for receiving said light collimated by said second cylindrical lens, where the beam-waist of said low-feedback-noise fiber collimator is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes; whereby said laser diode will be coupled to the single-mode fiber of said fiber collimator with high coupling-efficiency and low feedback-noise.

2. The apparatus of claim 1 wherein said low-feedback-noise fiber collimator comprises a C-lens and an angled fiber.
3. The apparatus of claims 2 wherein said angled fiber is a single-mode fiber.
4. The apparatus of claim 1 wherein said low-feedback-noise fiber collimator comprises a GRIN lens and an angled fiber.
5. The apparatus of claims 4 wherein said angled fiber is a single-mode fiber.
6. The apparatus of claim 1 wherein said low-feedback-noise fiber collimator comprises a lens and a single-mode fiber that are fused together.
7. An apparatus for coupling a laser diode to a single-mode fiber comprising:
 - (a) a laser diode for emitting astigmatic and elliptical light, where the long axis of the ellipse is the fast axis, the short axis of the ellipse is the slow axis, and said fast and slow axes are perpendicular;
 - (b) a collimating lens for collimating said light emitted from said laser diode in one of said axes;
 - (c) a cylindrical lens having:
 - a first positive surface for focusing said light emitted from said laser diode in the other one of said axes after passing through said collimating lens, where said focused light diverges after being focused, and

a second positive surface for collimating said diverging light after being focused by said first positive surface, where the beam-waist of said light collimated by said second positive surface in said other one of said axes is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes; and

(d) a low-feedback-noise fiber collimator for receiving said light collimated by said second surface of said cylindrical lens, where the beam-waist of said low-feedback-noise fiber collimator is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes; whereby said laser diode will be coupled to the single-mode fiber of said fiber collimator with high coupling-efficiency and low feedback-noise.

8. The apparatus of claim 7 wherein said low-feedback-noise fiber collimator comprises a C-lens and an angled fiber.

9. The apparatus of claims 8 wherein said angled fiber is a single-mode fiber.

10. The apparatus of claim 7 wherein said low-feedback-noise fiber collimator comprises a GRIN lens and an angled fiber.

11. The apparatus of claims 10 wherein said angled fiber is a single-mode fiber.

12. The apparatus of claim 7 wherein said low-feedback-noise fiber collimator comprises a lens and a single-mode fiber that are fused together.

13. An apparatus for producing astigmatic-aberration-free, circular collimated-laser-diode-beam comprising:

- (a) a laser diode for emitting astigmatic and elliptical light, where the long axis of the ellipse is the fast axis, the short axis of the ellipse is the slow axis, and said fast and slow axes are perpendicular;
- (b) a collimating lens for collimating said light emitted from said laser diode in one of said axes;
- (c) a first cylindrical lens for focusing said light emitted from said laser diode in the other one of said axes after passing through said collimating lens, where said focused light diverges after being focused; and
- (d) a second cylindrical lens for collimating said diverging light after being focused by said first cylindrical lens, where the beam-waist of said light collimated by said second cylindrical lens in said other one of said axes is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes; whereby said second cylindrical lens will output astigmatic-aberration-free, circular collimated-laser-diode-beam.

14. An apparatus for producing astigmatic-aberration-free, circular collimated-laser-diode-beam comprising:

- (a) a laser diode for emitting astigmatic and elliptical light, where the long axis of the ellipse is the fast axis, the short axis of the ellipse is the slow axis, and said fast and slow axes are perpendicular;
- (b) a collimating lens for collimating said light emitted from said laser diode in one of said axes; and
- (c) a cylindrical lens having:
- a first positive surface for focusing said light emitted from said laser diode in the other one of said axes after passing through said collimating lens, where said focused light diverges after being focused, and
- a second positive surface for collimating said diverging light after being focused by said first positive surface, where the beam-waist of said light collimated by said second positive surface in said other one of said axes is substantially equal to the beam-waist of said light collimated by said collimating lens in said one of said axes;
- whereby said cylindrical lens will output astigmatic-aberration-free, circular collimated-laser-diode-beam.